Standard 1

Number Sense and Computation

CORE STANDARD

Number Sense and Computation

Place Value

Understand and use the relationship among whole numbers, including place value, to identify and compare numbers up to 10,000.

[Standard Indicators: 3.1.1, 3.1.4]

Interpreting and Modeling Fractions

Interpret and model fractions as parts of a whole, parts of a group, and points and distances on a number line. Solve problems that involve comparing and ordering fractions.

[Standard Indicators: 3.1.2, 3.1.3]

Addition and Subtraction

Understand and use standard algorithms for addition and subtraction.

[Standard Indicator: 3.1.5]

Multiplication and Division

Understand the meaning of multiplication and division of whole numbers and show the relationship between them.

[Standard Indicators: 3.1.6, 3.1.7]

3.1.1 Count, read, write, compare and plot on a number line whole numbers up to at least 10,000.

Examples:

- Show where 349 appears on the number line.
- Given another number, tell if 349 is less than or greater than this number.

3.1.2 Interpret and model fractions as parts of a whole, parts of a group, and points and distances on a number line for numbers less than, equal to or greater than one.

Examples:

- Shade $\frac{3}{4}$ of a given shape.
- Model $\frac{3}{4}$ of a collection of beans.
- Label $\frac{3}{4}$ on a number line that has $\frac{1}{4}$ increments marked.

3.1.3 **Compare and order fractions by using models, benchmark fractions, or common numerators or denominators.**

Example: Have students fold paper to make halves, fourths and eighths. Assign to groups of students specific amounts to color such as $\frac{1}{2}$ or $\frac{1}{4}$. Arrange the finished art on the wall from smallest to largest, showing how $\frac{2}{4} = \frac{1}{2}$.

3.1.4 **Use words, models, standard form and expanded form to represent place value and to show equivalent forms of whole numbers up to at least 10,000.**

Example: Convert among numbers written in words, standard form and expanded form, such as four hundred ninety-two = 492 = 400 + 90 + 2.

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3.1.5 **Solve problems involving addition and subtraction of whole numbers fluently using a standard algorithmic approach.**

Example: Bob earned $547 in July and $568 in August. Bob told his friend he earned $1,103. Decide whether Bob is right or not and explain how you know.

3.1.6 **Represent the concept of multiplication of whole numbers with the following models: repeated addition, equal-sized groups, arrays, area models and equal "jumps" on a number line. Explain the result of multiplying by zero.**

Examples:

- Using base ten blocks, make an array of three rows of three blocks.
- Beginning at zero, make three hops of three to nine on the number line.
- Show the same amount as three groups of three items.

3.1.7 **Represent the concept of division of whole numbers with models as successive subtraction, partitioning, sharing and an inverse of multiplication. Show that division by zero is not possible.**

Examples:

- Start with 25 blocks and keep subtracting groups of five. How many groups of five can be made?
- Start with 25 blocks and find how many rows of five you can make.
- Start with 25 blocks and see how many groups of five you can make.
- Start with 25 blocks and make zero groups.
- Write the equation $\frac{25}{5} = 5$ in another way.

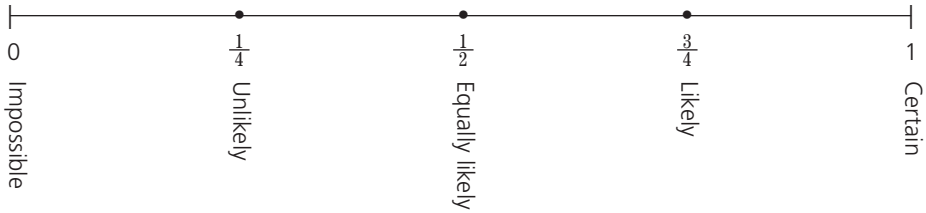
3.1.8 **Construct and analyze frequency tables and bar graphs from data, including data collected through observations, surveys and experiments.**

Example: Write a statement about the information displayed in the graph to express a conclusion about the information.

3.1.9 **Identify events on a continuum from impossible to unlikely, equally likely, likely or certain. Determine a simple probability in a context using pictures.**

Examples:

- Students will place the letter corresponding to the following events on the figure pictured below.



A. There are six cubes in a jar, and two are yellow. How likely are you to pull a yellow cube?

B. The probability that you will leave school before midnight.

C. The probability that a snowman in Indiana will stay in your backyard though the summer.

D. The probability that the sun will rise tomorrow.

- Flip a coin and then record the number of times the coin lands heads-up for 10 trials, then 20 trials.
- Spin a three-color spinner (red, yellow and green) and display the results for the number of times the spinner lands on a particular color.

Standard 2

Algebra and Functions

3.2.1 **Write and solve equations using (=) to show equivalence and use variables to express mathematical relationships involving multiplication.**

Example: If one ice cream sandwich costs 20 cents and two cost 40 cents, write the equation that will show how much n ice cream sandwiches cost.

3.2.2 **Create, extend and give a rule for number patterns by using multiplication.**

Example: Complete the following input-output table. Explain the rule you used to find the output.

Input	Output
5	50
2	20
7	

3.2.3 **Solve problems using the identity principle of multiplication.**

Example: Use arrays to model 1×5, 1×10, 1×3, 1×12 and then explain what happens whenever you multiply by one.

Standard 3

Geometry and Measurement

CORE STANDARD

Geometry and Measurement

Points and Lines

Identify, describe and draw points, lines and line segments.

[Standard Indicator: 3.3.2]

Length, Weight and Unit Conversions

Choose and use appropriate units and tools to estimate and measure length and weight. Use the relationship between the units to express answers in different units.

[Standard Indicator: 3.3.5]

3.3.1 Identify angles that are right angles and other angles that are greater than or less than a right angle.

Example: Use the corner of a piece of paper as a right angle finder to search for right angles in the classroom.

3.3.2 Identify, describe and draw points, lines and line segments and use these terms when describing two-dimensional shapes.

Example: Draw a line segment $\overline{AB}$ that is 2 cm long.

3.3.3 Identify and draw lines of symmetry in geometric shapes and recognize symmetrical shapes in the environment.

Example: Use pencil and paper or a drawing program to draw all the lines of symmetry in a square.

3.3.4 Find the perimeter of polygons.

Example: Measure your desk in centimeters and then find the perimeter.

3.3.5 Choose and use appropriate units and tools to estimate and measure length and weight. Estimate and measure length to a quarter-inch, weight in pounds and kilograms, and read temperature in Celsius and Fahrenheit. Select appropriate units for the given situation. Use the relationship between the units to express answers in different units.

Examples:

- Estimate and then measure the weight of your book bag in pounds and in ounces.
- Estimate and then read the temperature on a thermometer in degrees Fahrenheit and degrees Celsius.

3.3.6 Using an analog clock, tell time to the nearest minute.

Example: If you have to be to school at 8:00 a.m. and the car ride is 15 minutes, when do you need to leave for school?

PROCESS STANDARDS

Indiana's Academic Standards for Mathematics describe the key content of each grade level and course, and students must develop conceptual understanding of this content. The American Diploma Project noted that, "beyond acquiring procedural mathematical skills with their clear methods and boundaries, students need to master the more subjective skills of reading, interpreting, representing and 'mathematicizing' a problem" (p. 55).

The National Council of Teachers of Mathematics has described five Process Standards that "highlight ways of acquiring and using content knowledge" (p. 29). The following Process Standards must be addressed throughout the learning and teaching of Indiana's Academic Standards for Mathematics in all grade levels in mathematics.

Problem Solving

- Build new mathematical knowledge through problem solving.
- Solve problems that arise in mathematics and in other contexts.
- Apply and adapt a variety of appropriate strategies to solve problems.
- Monitor and reflect on the process of mathematical problem solving.

Reasoning and Proof

- Recognize reasoning and proof as fundamental aspects of mathematics.
- Make and investigate mathematical conjectures.
- Develop and evaluate mathematical arguments and proofs.
- Select and use various types of reasoning and methods of proof.

Communication

- Organize and consolidate mathematical thinking through communication.
- Communicate mathematical thinking coherently and clearly to peers, teachers and others.
- Analyze and evaluate the mathematical thinking and strategies of others.
- Use the language of mathematics to express mathematical ideas precisely.

Connections

- Recognize and use connections among mathematical ideas.
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
- Recognize and apply mathematics in contexts outside of mathematics.

Representation

- Create and use representations to organize, record and communicate mathematical ideas.
- Select, apply and translate among mathematical representations to solve problems.
- Use representations to model and interpret physical, social and mathematical phenomena.

In addition, estimation, mental computation and technology are areas that need to be addressed at all grade levels in mathematics.

Estimation and Mental Computation

- Know and apply appropriate methods for estimating the results of computations.
- Round numbers to a specified place value.
- Use estimation to decide whether answers are reasonable.
- Decide when estimation is an appropriate strategy for solving a problem.
- Determine appropriate accuracy and precision of measurements in problem situations.
- Use properties of numbers and operations to perform mental computation.
- Recognize when the numbers involved in a computation allow for a mental computation strategy.

Technology

- Technology should be used as a tool in mathematics education to support and extend the mathematics curriculum.
- Technology can contribute to concept development, simulation, representation, communication and problem solving.
- The challenge is to ensure that technology supports, but is not a substitute for, the development of skills with basic operations, quantitative reasoning and problem-solving skills.
  - Elementary students should learn how to perform thoroughly the basic arithmetic operations independent of the use of a calculator.
  - The focus must be on learning mathematics and using technology as a tool rather than as an end unto itself.

References

American Diploma Project (2004). *Ready or Not: Creating a High School Diploma that Counts*. Washington, D.C.: Achieve, Inc.

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*. Reston VA: author.